Cavity QED and Confined Phonons in Semiconductor Quantum Dots

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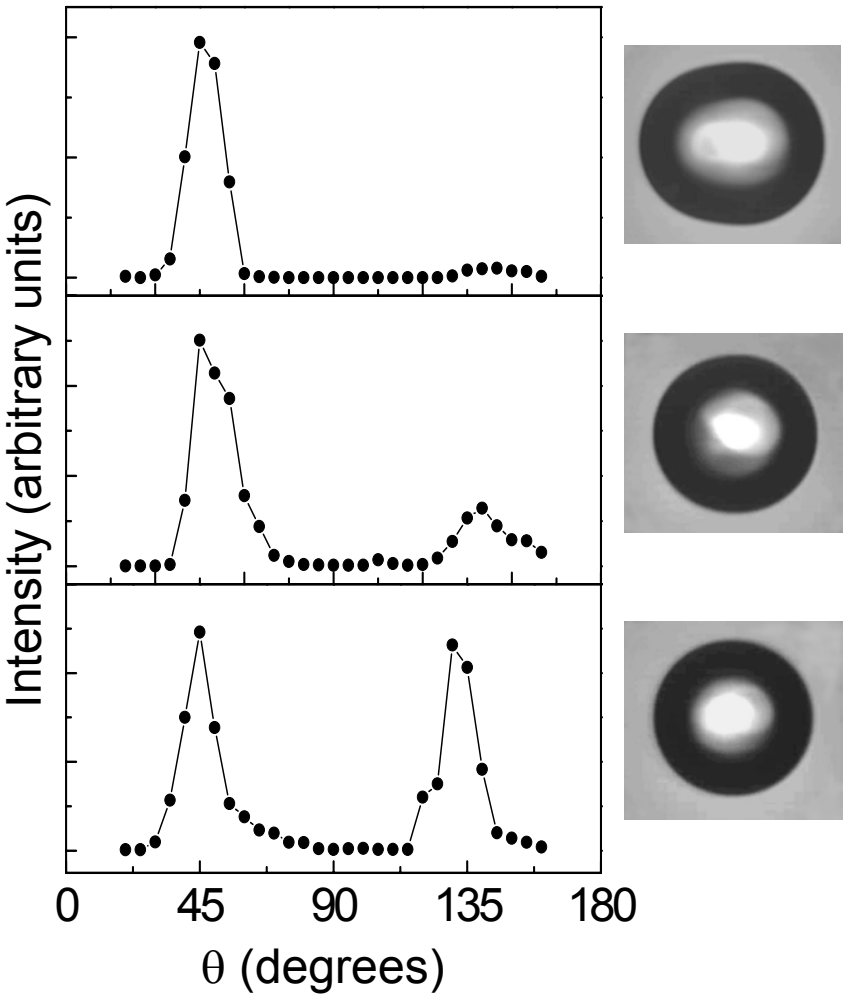
These figures show far-field emission patterns from spheroidal optical resonators. In these resonators, whispering gallery modes form via total internal reflection along a curve boundary. A slight deformation from the exact spherical shape leads to highly directional emission while maintaining the high Q-factor of the resonator. With decreasing deformation, the emission pattern evolves from a single peak to double peaks, reflecting an underlying qualitative change in the escape mechanism from refractive escape due to chaotic diffusion of light rays to evanescent tunneling. In addition to cavity QED studies, whispering gallery resonators with both a high-Q factor and a directional emission pattern are also important for applications such as photonics and biosensing.



Lacey *et al*., Phys. Rev. Lett. **91**, 033902 (2003).
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Education:

Four graduate students (Sasha Tavenner Kruger, Phedon Palinginis, Scott Lacey, and Yumin Shen) and one undergraduate student (Joe Cox) contributed to this project. Sasha Tavenner Kruger and Scott Lacey received the IGERT fellowship from the NSF. Joe Cox received a REU award from NSF.

Scott Lacey successfully defended his PhD thesis titled “Ray and wave dynamics in three dimensional asymmetric optical resonators” this August. He is now a tenure track assistant professor at Franklin and Marshall College in Pennsylvania.